NASA Procedural Requirements

NPR 7120.10
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COMPLIANCE IS MANDATORY

Technical Standards for NASA Programs and Projects

Responsible Office: Office of the Chief Engineer

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Preface

P.1 Purpose

a. This NASA Procedural Requirements (NPR) supports the implementation of the standards aspects of the parent NASA Policy Directive (NPD) 7120.4, NASA Engineering and Program/Project Management Policy. This NPR establishes responsibilities, requirements, and processes for:

(1) Developing technical standards products, complying with Federal requirements for participating in the development of voluntary consensus standards and designating NASA-endorsed technical standards products.

(2) Selecting and using technical standards products as program/project requirements, encouraging commonality in use across NASA programs and projects, and mandating use of specific technical standards products when warranted.

P.2 Applicability

a. This NPR is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the Jet Propulsion Laboratory (JPL), other contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.

b. Technical standards products and this NPR are also applicable to programs and projects managed under NPR 7120.5, NASA Space Flight Program and Project Management Requirements; NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements; and NPR 7120.8, NASA Research and Technology Program and Project Management Requirements.

c. For the purposes of this NPR, the following apply:

(1) The term “NASA technical standards products” refers to technical standards, specifications, and handbooks developed and approved by NASA Headquarters offices, assigned a prefix of “NASA-STD-,” “NASA-SPEC-,” or “NASA-HDBK-,” respectively, to the unique document number.

(2) The term "technical standard" as used in this document is defined in Appendix A and excludes NASA handbooks and NASA specifications.

d. This NPR does not apply to development of Center-specific and/or program/project-specific technical standards products.

P.3 Authorities

a. 15 U.S.C. § 272(b), as amended.

b. OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.

c. NPD 1000.0, NASA Governance and Strategic Management Handbook.

d. NPD 1000.3, The NASA Organization.

e. NPD 1400.1, Documentation and Promulgation of Internal NASA Requirements.

f. NPD 7120.4, NASA Engineering and Program/Project Management Policy.

P.4 Applicable Documents

a. NPR 1441.1, NASA Records Retention Schedules.

b. NPR 7120.5, NASA Space Flight Program and Project Management Requirements.

c. NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.

d. NPR 7120.8, NASA Research and Technology Program and Project Management Requirements.

e. NPR 8715.3, NASA General Safety Program Requirements.

f. NPR 8900.1, Health and Medical Requirements for Human Space Exploration.

g. NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements.

P.5 Measurement/Verification

Compliance with this NPR is verified by submission to responsible NASA officials of products identified in this document and by internal and external controls. Internal controls include audit, review, and assessment processes defined in NPD 1200.1, NASA Internal Control. External controls may include external audits and reporting requirements.

P.6 Cancellation

None.

/S/
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Chapter 1. Introduction

1.1 Overview

1.1.1 Technical standards products are important to the Agency for many reasons, including, but not limited to:

a. Complying with legal and other requirements imposed upon NASA by a higher authority (e.g., Presidential direction).

b. Using in the review of contract proposals to verify that they meet technical requirements and for in-house design and development efforts by support contractors.

c. Capturing and disseminating lessons learned to share experiences and new technology.

d. Facilitating engineering excellence in development studies and operations.

e. Providing a common base for interoperability and supplier operations.

f. Preventing conflict and duplication of effort.

g. Fostering and supporting reuse and sharing.

Chapter 2. Responsibilities

Note: This chapter defines the roles and responsibilities of key officials in the technical standards products management process. The roles and responsibilities of senior NASA management, along with fundamental principles of governance, are defined in NPD 1000.0, NASA Governance and Strategic Management Handbook, and further described in NPD 1000.3, The NASA Organization. Additional roles and responsibilities with respect to technical standards products are defined in NPD 7120.4.

2.1 The NASA Chief Engineer

2.1.1 The NASA Chief Engineer serves as NASA's Standards Executive to:

a. Provide external coordination of NASA technical standards product activities.

b. Provide NASA representation on the Interagency Committee for Standards Policy.

c. Issue a call for information and submit NASA's annual report on voluntary consensus standards activities and conformity assessment to the Office of Management and Budget (OMB) through the National Institute of Standards and Technology (NIST).

2.1.2 The NASA Chief Engineer evaluates the effectiveness of NASA technical standardization activities.

2.1.3 The NASA Chief Engineer coordinates and assesses Agency implementation of policy, procedural requirements, and activities for technical standards products with other NASA Headquarters offices, Center Directors, and Technical Authorities.

2.1.4 The NASA Chief Engineer provides access to technical standards products at https://standards.nasa.gov.

2.2 NASA Headquarters Offices that Produce or Participate in Development of Technical Standards Products

2.2.1 NASA Headquarters offices consult with voluntary consensus standards bodies, support and authorize participation of employees in voluntary consensus standards development, and provide input to the NASA Chief Engineer.

2.2.2 NASA Headquarters offices develop processes to approve development and produce and maintain NASA technical standards products within their areas of responsibility consistent with the requirements of this NPR.

2.2.3 NASA Headquarters offices designate NASA-endorsed technical standards products.

2.2.4 The NASA Chief Engineer, the Chief, Safety and Mission Assurance, and the Chief Health and Medical Officer serve as or may delegate Technical Authority for all technical standards products within their areas of responsibility.

2.2.5 NASA Headquarters Offices periodically review compliance with technical standards products within their areas of responsibility.

2.3 Mission Directorates and Program and Project Managers

2.3.1 Mission Directorates and program and project managers support the Agency's established processes for reviewing technical standards products for technical accuracy and adequacy and provide comments when necessary.

2.3.2 Mission Directorates and program and project managers evaluate, select, tailor, when necessary, and use technical standards and specifications as program and project requirements in accordance with NPR 7120.5, NPR 7120.7, NPR 7120.8, or NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements, observing and protecting copyrights and managing classified national security and sensitive but unclassified information.

2.4 Center Directors

2.4.1 Center Directors, or designees, support established processes for (1) development and maintenance of voluntary consensus standards and other Government technical standards products, (2) NASA technical standards products, including but not limited to, maintenance and improvement of NASA technical standards products for which they have assigned responsibility, and (3) designation and use of NASA-endorsed technical standards products.

2.4.2 Center Directors, or designees, promote and authorize participation of their employees in voluntary consensus standards bodies and report annually on these activities to the NASA Chief Engineer to support NASA's annual report to NIST.

Chapter 3. Selection and Use of Technical Standards Products

Note: A technical standard or specification is not "self-imposing," i.e., it is not mandatory for use by a performing entity unless: (1) Cited as a requirement within a NASA directive or U.S. law. (2) Invoked by other NASA requirements documents (e.g., contracts, including, but not limited to, the JPL contract and program/project documents). Requirements in technical standards and specifications are identified by using the word "shall" and denote mandatory compliance by programs and projects.

3.1 Selection of Technical Standards Products

3.1.1 Program and project managers, in conjunction with the appropriate Technical Authority, shall select technical standards products based on currency and applicability for use as program/project requirements according to the following order of priority:

a. Technical standards required by legal requirements.

b. Technical standards products designated as mandatory by NPDs and NPRs.

c. Technical standards products necessary to promote mission success and engineering excellence. When all other factors are the same, select in the following order of precedence:

(1) Voluntary consensus standards, domestic and international.

(2) NASA or other Government technical standards products.1

3.1.2 Program and project managers, in conjunction with the appropriate Technical Authority, shall select current versions of technical standards products except when justified as impractical or incompatible with requirements.

Note: Promote commonality in the use of technical standards products across NASA.[1]

3.1.3 Program and project managers shall review lessons learned, including but not limited to, those in the NASA Lessons Learned Information System, for applicability to current technical standards applications.

3.1.4 Program and project managers, NASA Headquarters offices, and Center Directors shall give preference to performance (outcome-based) standards in program/project technical requirement specifications over prescriptive design or process (product-based) standards.

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[1] Consider NASA-endorsed technical standards products, accessible at https://standards.nasa.gov, first.

3.2 Tailoring of Technical Standard and Specification Requirements

3.2.1 NASA Headquarters offices and program and project managers shall:

a. Tailor, when necessary, selected technical standard or specification requirements (i.e., document

necessary changes) to meet specific application needs and to avoid over- or under-specification of requirements.

b. In the case when the technical standard or specification is invoked by a NASA directive or other NASA requirements document (e.g., a contract), document traceability of tailored requirements to the original standard or specification requirements and obtain approval from the appropriate Technical Authority as required by NPR 7120.5, NPR 7120.7, NPR 7120.8, NPR 8900.1, Health and Medical Requirements for Human Space Exploration, and for Safety and Mission Assurance, by NPR 8715.3, NASA General Safety Program Requirements, and NASA-STD-8709.20.

> *Note: Tailoring of technical standards and specifications required by law or Federal regulation requires General Counsel and Technical Authority involvement.*

c. Ensure that requirements from voluntary consensus, other Government organizations, and NASA technical standards products used as requirements in program and project documentation are traceable to the original standards product and track changes for review and potential revision to program/project requirements.

3.3 Use of Technical Standards Products

3.3.1 Program and project managers shall:

a. Use established voluntary consensus standards, both domestic and international, in lieu of other Government organizations and NASA technical standards products as program/project requirements unless use of such standards products would be inconsistent with applicable laws or NASA NPDs/NPRs, technically inadequate, or otherwise impractical.

b. Evaluate NASA-endorsed technical standards products for use when selecting program and project requirements.

c. Register to receive notification of changes to technical standards products imposed as requirements at https://standards.nasa.gov.

d. Review changes to imposed standards products to determine the need for revision of program/project requirements.

3.4 Agency's Annual Report on Standards

3.4.1 NASA Headquarters offices and Center Directors, or their designees, shall submit to the NASA Chief Engineer input for NASA's annual report to NIST as required by OMB Circular No. A-119 describing NASA's use of voluntary consensus standards, participation in the development of voluntary consensus standards and voluntary consensus standards bodies, and conformity assessment based on guidance issued by the Secretary of Commerce.

Chapter 4. Development of Technical Standards Products

4.1 NASA Participation in Standards Development with Voluntary Consensus Standards Bodies and Other Government Organizations

4.1.1 NASA Headquarters offices shall determine, when a need is identified, if a voluntary consensus standard or other Government standards product exists or is in development that meets or can be adapted to meet NASA's needs.

4.1.2 NASA Headquarters offices, Center Directors, or designees shall endorse participation of their employees in the development of voluntary consensus and other Government standards products in areas where participation is in the public interest and is compatible with NASA's mission, authorities, and budget resources.

4.2 Development of NASA Technical Standards Products

4.2.1 Criteria for development of NASA Technical Standards products.

4.2.1.1 NASA Headquarters offices that produce NASA technical standards products shall approve development of new NASA technical standards products when warranted and the following criteria are met:

a. Search for and evaluation of similar technical standards products have determined that established voluntary consensus standards or other Government technical standards products do not exist, are not in development, or cannot be adapted (tailored) to meet NASA's technical needs;

b. All basic research and testing have been completed to promote development of the technical standards product within a 12-month timeframe and within allocated budget unless an extension and/or additional budget are approved by the NASA Headquarters office producing the technical standards product;

c. A technical standards product is necessary to establish an Agency-wide level of control over practices and processes that have been identified, such as problem areas or areas contributing to past incidents, near misses, failures, or reduced mission capability;

d. A technical standards product is necessary to capture NASA-unique best practices, needs, and significant lessons learned; and

e. The proposed technical standards product will be used by multiple NASA Centers and/or multiple programs/projects that perform the specific technical discipline.

4.2.2 An Agency-wide review of NASA Technical Standards products.

4.2.2.1 NASA Headquarters offices shall conduct Agency-wide technical reviews for adequacy and accuracy of each proposed document.

4.2.3 Disposition of comments to NASA Technical Standards products.

4.2.3.1 NASA Headquarters offices shall document and disposition all comments received from reviewers and provide the dispositions to all reviewers.

4.2.3.2 NASA Headquarters offices shall ensure that unresolved comments relative to NASA technical standards products are appealed to the next higher level of authority, leading up to the responsible NASA Headquarters office in accordance with the process for handling dissenting opinions in NPR 7120.5.

4.2.4 Process for maintaining and developing NASA Technical Standards products.

4.2.4.1 NASA Headquarters offices, or designees, shall:

a. Review their NASA technical standards products and document the results at least once every five years for relevancy, currency, technical accuracy and adequacy, conflict with or duplication of other requirements, changes in scope, and feasibility of replacing the existing NASA technical standards product with, or converting it to, a voluntary consensus standard and cancelling the NASA technical standards product.

b. Establish, document, and implement a process to control revalidation, revisions, and cancellation of NASA technical standards products.

> *Note: Configuration management of standards product documentation is applied in this process.*

c. Maintain NASA technical standards products in accordance with NPR 1441.1, NASA Records Retention Schedules.

4.2.4.2 NASA technical standards product development for engineering shall follow the direction provided by the NASA Chief Engineer.

Note: The current directions for engineering standards products are provided at https://standards.nasa.gov/documents/ProcessforNASA-DevelopedStandards.pdf.
Note: Other NASA Headquarters offices, with the exception of the Office of Safety and Mission Assurance and the Health and Medical Office, may utilize the process specified in paragraph 4.2.4.2.

4.2.4.3 NASA technical standards product development for safety and mission assurance shall follow the direction provided by the NASA Chief, Safety and Mission Assurance.

> *Note: The current directions for safety and mission assurance standards products are provided at http://nodis3.gsfc.nasa.gov/hq_isodetail.cfm?id=H_OWI_1410_GA000_002_E_.*

4.2.4.4 NASA technical standards product development for health and medical shall follow the direction provided by the NASA Chief Health and Medical Officer.

> *Note: The current directions for health and medical standards products are provided at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8900s=1.*

4.2.4.5 NASA technical standards product development for information technology shall follow the direction provided by the NASA Chief Information Officer.

Note: The current directions for information technology standards products are provided at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=2800&s=1.

4.3 Designation of NASA-Endorsed Technical Standards Products

4.3.1 NASA Headquarters offices shall identify and approve NASA, voluntary consensus, and other Government technical standards products as NASA-endorsed technical standards products based on the following criteria:

a. The technical standards product is approved in accordance with a documented, approved process and is reviewed and updated on a periodic basis;

b. The technical standards product addresses common, high-level functions that need to be addressed by projects across or within a given program or elements across or within a given project;

> *Note: Applicability of NASA-endorsed technical standards products may be specified by the NASA Headquarters offices.*

c. The technical standards product uses best engineering practices representative of the most current proven technology;

d. The technical standards product is widely accepted by discipline experts from industry, military, academia, and NASA to ensure proven, consistent, common practices in the discipline area are applied; and

e. The technical standards product does not include program- or project-specific or Center documents, handbooks, laboratory procedures or processes, or procurement specifications.

Note: The list of NASA-endorsed technical standards products which resides at https://standards.nasa.gov will be updated as necessary using the above criteria.

4.3.2 Technical standards products whose use is required by a higher-level document (e.g., NPD, NPR, other required NASA-generated technical standards product (not a voluntary consensus standard), or by Federal law/regulation/statute) by the use of a "shall" requirement (or equivalent requirement designation) shall be designated as "NASA-endorsed, mandatory standards."

Appendix A. Definitions

A.1 Agency. The National Aeronautics and Space Administration (NASA).

A.2 Applicable Documents. Citations consisting of documents cited in the body of the document that contain provisions or other pertinent requirements directly related to and necessary for the performance of the activities specified by the document. (Source: NPR 1400.1, NASA Directives Procedural Requirements.)

A.3 Cancellation. A process of rendering a standard inactive.

A.4 Consensus. General agreement, but not necessarily unanimity, and includes a process for attempting to resolve objections by interested parties, as long as all comments have been fairly considered, each objector is advised of the disposition of his or her objection(s) and the reasons why, and the consensus body members are given an opportunity to change their votes after reviewing the comments. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.5 Handbook (HDBK). A handbook is a guidance document that provides engineering information; lessons learned; possible options to address technical issues; classification of similar items, materials, or processes; interpretative direction and techniques; and any other type of guidance information that may help the Government or its contractors in the design, construction, selection, management, support, or operation of systems, products, processes, or services. (Source: MIL-STD-967, Defense Handbooks, Format and Content.) Also, a how-to document containing procedural, technical, engineering, or design information or data about materials, processes, practices, or methods.

A.6 Impractical. Includes circumstances when the use of voluntary consensus standards would fail to serve the Agency’s program needs; would be infeasible; or would be inadequate, ineffectual, or inconsistent with the Agency’s mission. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.7 NASA-Endorsed Technical Standards Products. Proven technical standards products that have been identified and recommended by NASA Headquarters offices for particular types of applications and should be considered for use as a first order in developing technical requirements for current and future NASA programs and projects.

A.8 NASA Technical Standards Products. NASA documents that contain common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices. NASA technical standards products may contain the definition of terms; classification of components; delineation of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size or strength. The term “NASA technical standards products” refers to technical standards, specifications, and handbooks developed and approved by NASA Headquarters offices, assigned a prefix of “NASA-STD-,” “NASA-SPEC-,” or “NASA-HDBK-,” respectively, to the unique document number.

A.9 Other Government Standards. Technical standards product documentation originated and published by Government agencies other than NASA (e.g., military (MIL), Federal (FED),

Department of Defense (DoD)).

A.10 Performance Standard. A standard that states requirements in terms of required results with criteria for verifying compliance but without stating the methods for achieving required results; may define the functional requirements for the item, operational requirements, and/or interface and interchangeability characteristics; also may be viewed in juxtaposition to a prescriptive standard. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.11 Prescriptive Standard. A standard which may specify design requirements such as materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.12 Reference Documents. Citations in documents that may consist of external requirements that are stated but not cited in the text or the document or may be documents that are considered to be useful as background information for the user to help in understanding the subject matter but do not constitute requirements of the document. (Source: NPR 1400.1, NASA Directives Procedural Requirements.)

A.13 Specification (SPEC). A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behavior, or characteristics of a system or system component. (Source: NPR 7123.1, NASA Systems Engineering Processes and Requirements.)

A.14 Standard (STD). Common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices; the definition of terms, classification of components; delineation of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size and strength. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.15 Tailoring. The documentation and approval of the adaptation of the process and approach to complying with requirements underlying the specific program or projects. Tailoring considerations include system size and complexity, level of system definition detail, scenarios and missions, constraints and requirements, technology base, major risk factors, and organizational best practices and strengths. Critical project considerations (e.g., public safety, security, litigation exposures) may preclude tailoring out required process activities, regardless of cost, manpower available, or other considerations. (Source: NPR 7123.1, NASA Systems Engineering Processes and Requirements.)

A.16 Technical Requirements. Requirements that discuss the design, performance, operational parameters, and constraints of equipment and systems. These are requirements that would typically be contained within a system or equipment specification. Requirements are identified by the word “shall.” (Source: NPR 1400.1, NASA Directives Procedural Requirements.)

A.17 Technical Standard. NASA, voluntary consensus, and other Government documents that contain common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices. (Source: NPR 7120.5, NASA Space Flight Program and Project Management Requirements.)

A.18 Use. Incorporation of a standard in whole, in part, or by reference for procurement purposes, and the inclusion of a standard in whole, in part, or by reference in regulation(s). (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus

Standards and in Conformity Assessment Activities.)

A.19 Voluntary Consensus Standards. Standards developed or adopted by voluntary consensus standards bodies, both domestic and international, that include provisions requiring that owners of relevant intellectual property have agreed to make that intellectual property available on a non-discriminatory, royalty-free, or reasonable royalty basis to all interested parties. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

A.20 Voluntary Consensus Standards Bodies. Domestic or international organizations that plan, develop, establish, or coordinate voluntary consensus standards using agreed-upon procedures and are defined by the following attributes: (1) openness, (2) balance of interest, (3) due process, (4) an appeals process, and (5) consensus. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

Appendix B. Acronyms

DoD	Department of Defense
FED	Federal
HDBK	Handbook
JPL	Jet Propulsion Laboratory
MIL	Military
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
OMB	Office of Management and Budget
SMA TA	Safety and Mission Assurance Technical Authority
SPEC	Specification
STD	Standard
USC	United States Code

Appendix C. Reference Documents

a. NPD 1200.1, NASA Internal Control.

b. NPR 7123.1, NASA Systems Engineering Processes and Requirements.

c. MIL-STD-967, Defense Handbooks, Format and Content.